

Newcastle University

Undergraduate Study

Electrical, Electronic and Computer Engineering

Why study Electrical, Electronic *or* Computer Engineering?



Electrical, electronic and computer engineering provides the key to our future in the information age. The technical elements range from the design of microelectronic components, whose dimensions can be measured in atoms, to electrical installations supplying power to the world's largest cities. Our subjects also include information technology, communications, medical electronics, computers, aerospace, robotics, automation and all applications of electricity.

In choosing a degree in electrical, electronic or computer engineering you are embarking upon a challenging career in which you can make a major contribution to the world in which we live.

Why study at Newcastle?

- Electrical and electronic engineering is one of five engineering disciplines taught at the University, making Newcastle by far the largest institution offering engineering degrees in the North East.
- A large number of leading engineering specialists contribute to the teaching and design of our degree programmes.
- All of our programmes are fully accredited by the Institution of Engineering and Technology (IET).
- The quality of teaching for our degree programmes was rated as excellent in the most recent national teaching quality assessment exercise with full marks in the areas of: learning resources; student support and guidance; and curriculum design, content and organisation.
- Our state-of-the-art teaching and computing facilities include one of the UK's largest electrical power laboratories.
- In the most recent National Student Survey, 96 per cent of our students said they were satisfied with the quality of their course.
- We are one of only three UK universities to be a member of the E3 Academy, which offers sponsorship in leading UK companies.
- We are actively involved in research and are recognised for our research excellence in communications, microelectronics and electrical power engineering.
- We offer excellence scholarships of £1,000 per year of study.

The School of Electrical, Electronic and Computer Engineering

The School of Electrical, Electronic and Computer Engineering is located in Merz Court in the heart of our city centre campus. There are approximately 165 undergraduate students and about 300 postgraduates, making our subject area large enough to support a range of activities but still small enough for staff and students to get to know each other. An active staff–student committee gives you the opportunity to influence decisions and contribute to discussions about all aspects of life at Newcastle University. Students are also involved in the regional branch of the Institution of Engineering and Technology (IET), which runs social events and provides more opportunities for contact with practising engineers in the region.

In addition to the MEng and BEng degrees, we run Foundation Year programmes for applicants without the appropriate science qualifications (see page 11). All of our degrees are Institution of Engineering and Technology (IET) accredited, providing a good foundation for professional registration.

Degrees available

- Electrical and Electronic Engineering (MEng/BEng)
- Electronic Engineering (MEng/BEng)
- Electronic Communications (MEng/BEng)
- Electronics and Computer Engineering (MEng/BEng)
- Foundation Year Entry
- Engineering with Foundation Year

MEng or BEng?

The Master of Engineering (MEng) programme lasts for four years and the Bachelor of Engineering (BEng) takes three. You can apply for either, and you can transfer between MEng and BEng versions of the same degree up to the end of Stage 2, depending upon your examination performance. We believe this flexibility is important for our students. If you want to become a Chartered Engineer it is recommended by the Engineering Council that you study for a MEng degree, as this is the most direct way to become professionally qualified.

The BEng degree might be more appropriate if you'd like to consider Chartered Engineer status or a separate Master's degree at a later stage in your career, or if you are an international student who doesn't need British Chartered Engineer status.



"Studying electronics is fairly challenging, but all my lecturers and tutors provide amazing support! I love the facilities that the University provides – the electronics labs and computer clusters are all brand new with state-of-the-art equipment."

Diarmaid, Electrical and Electronic Engineering BEng Honours

Facilities

Continued investment in undergraduate teaching laboratories, together with equipment made available through research, means that we have an excellent learning environment. There are modern laboratories for students in Stages 1 and 2, while in Stages 3 and 4 you have access to our state-of-the-art research laboratories, which include ‘class 100’ clean rooms (necessary for the fabrication of semi-conductor devices), a machines laboratory, a screened room, a resilient electronics facility and electronics laboratories. A team of technicians ensures that your laboratory work runs smoothly, assisting with test and measurement equipment and the construction of project work.

You will have access to PCs and UNIX-based workstations, which are used for specialised electronic-simulation packages and project work. Within Merz Court, there is a student common room, a reading room, a refectory and a University computer cluster.

Teaching and assessment

The quality of our teaching and the provision of facilities have been recognised as excellent in the most recent national teaching quality assessment exercise. We achieved full marks for learning resources, student support and guidance, and curriculum design, content and organisation. We believe it is important to teach from experience, and our staff are actively engaged in leading-edge research that feeds directly into our undergraduate programmes. We are fortunate to have a number of world-class research groups based within the School, which provide additional expert knowledge and equipment in this rapidly moving subject. We also have many links with industry, both locally and beyond, and visiting professors provide industry-focused lectures and advice on curriculum design.

Project work

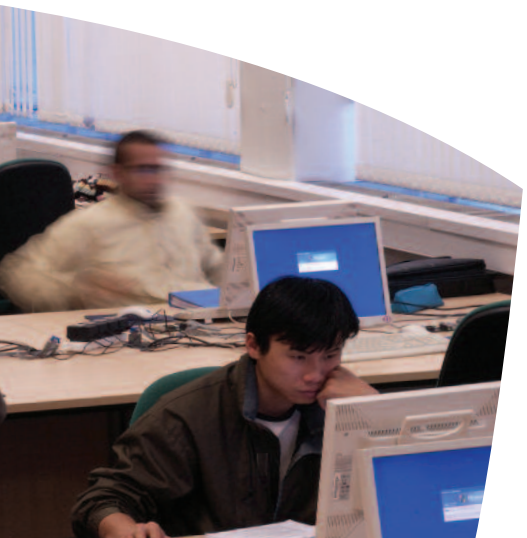
Throughout all the degree programmes you undertake projects during laboratory classes that develop valuable transferable skills such as communication and report writing. At Stage 3 you undertake a project under one-to-one supervision from a member of staff, and for MEng students in Stage 4 project groups meet regularly with academic staff. Project work is assessed and, together with practical work, contributes to your final results. Other aspects of the programmes are assessed by a mixture of formal examinations and in-course assessment.



Our 70-seat computer lab is equipped with interactive teaching tools, embedded computer boards and a range of electronics CAD.

Research

Research is organised into four groups covering: communications and signal processing; power electronics, drives and machines; microelectronics system design; and nanomaterials and electronics.
Each group is led by international experts in their fields and all the major researchers are also involved in the teaching of our undergraduate programmes. You undertake project work in association with these research groups in the later Stages of your degree programme, gaining access to specialist equipment and laboratory space. If you do well in your studies you may have the opportunity to progress to a postgraduate degree, and we have around 130 research students in the School.



Links with industry

All our degree programmes are structured to involve contact with industry and the practical application of scientific principles to industrial situations. When the degree programmes were designed, a group of advisers from industry were consulted, who continue to provide expertise and advice on the industrial relevance of our programmes. Your contact with industry is achieved through various forms of project work and case study materials. All Stage 1 modules include industrial lectures and a programme of industrial visits gives you the opportunity to see engineering in action. In addition, you are strongly encouraged to seek industrial vacation training, particularly between Stages 2 and 3, if you are not already obtaining such experience by sponsorship.

Stage 4 MEng students will undertake a three-month industrial project for four days each week. Many students choose to do this at a local company, but the project can be taken anywhere in the UK or abroad. Participating companies have included GE Aviation, Converteam, Siemens, Cummins, Dyson, Control Techniques, Parker SSD, Applied Imaging, the BBC, BNFL, Bonas, Filtronic, IPower, Marconi Matra, Rolls-Royce, SevCon, Siemens and Vickers. Recent projects have included satellite electronic communication systems for mobile phones and navigation, protocols for electronic drive control, an electric bike, and underwater autonomous vehicle control.

Careers

Our degree programmes place great emphasis on the development of the broad range of skills sought by employers, and that's just one of the reasons why 90 per cent of our recent electrical engineering graduates are in graduate-level jobs within six months of leaving University. The University's award-winning Careers Service provides an extensive range of employment and vacancy information, and can offer guidance and support throughout your time here as a student and for up to three years after graduation.

In recent years our graduates have gone on to work in engineering research and development, design, production and manufacturing engineering, finance, consultancy and information technology. Employers include a wide range of local, national and international organisations, such as BT, Deloitte & Touche, London Underground, Motorola, National Grid, Nokia, Nortel, Rolls-Royce and Sony Ericsson Mobile Communications.

At Newcastle we provide an extensive range of opportunities through ncl+ to enable you to develop personal, employability and enterprise skills, and to give you a real edge in the employment market after you graduate. For more details, including examples of graduate destinations, see **www.ncl.ac.uk/undergraduate/careers**



> I have accepted a job designing motors for Dyson Technologies. I carried out my fourth year placement there and they were impressed enough to offer me a full-time position. I know other students on the course also got job offers after their placements had finished, which shows the quality of the teaching within the School.

Sam, Graduate, Electrical and Electronic Engineering MEng Honours

Electrical and Electronic Engineering

MEng Honours (4 years) UCAS code H605
BEng Honours (3 years) UCAS code H607

Electronic Engineering

MEng Honours (4 years) UCAS code H602
BEng Honours (3 years) UCAS code H610

Our degrees in Electrical and Electronic Engineering, and Electronic Engineering aim to give you the widest possible choice of career opportunities. Initially they provide you with a solid foundation of knowledge, followed by a wide range of specialist options to choose from at later Stages. Stages 1 and 2 in particular develop your theoretical and practical skills in engineering, along with communication and management skills. All subjects are supported by laboratory sessions, a large proportion of which are in the form of project-based work that prepares you for more advanced, industrial-related project work at later Stages.

Stage 3 of the programmes allows you to specialise in either electrical power or industrial electronics as part of the Electrical and Electronic Engineering programme, and in either communication electronics or microelectronics as part of the Electronic Engineering programme. This involves a substantial individual project in your chosen area. You also select specialist modules from a wide choice that is continually updated to keep pace with changes in technology and its applications.

The MEng degrees offer increased depth of study, mainly within the same framework of electrical and electronic modules. In the additional year you undertake an individual project of a technical nature that requires the development of hardware and software systems. You also carry out a group project, which is often defined by an external industrial concern, a design study and a major technical review. An important part of the MEng programme is taking part in industrial or research activity, either in the UK or abroad, and you spend three months working, under guidance, as a junior engineer in a real commercial environment.

MEng and BEng degrees

Stage 1

Circuit theory (20) introduces linear electric circuits and the various tools and techniques employed to analyse more complex circuits in terms of their currents, voltages and power flows.
Electronics I (20) provides an enhanced understanding of basic semiconductor devices, combinational and sequential elements, computer number systems and computer architecture.
Engineering mathematics (20) explores the foundations of basic calculus, differential equations, matrices and vectors in an engineering context.
Fields, materials and devices I (20) examines the basic principles of electromagnetic fields and the application of these fields to electrical machines and semiconductor devices.
Signals and communications I (20) provides an introduction to mobile communication systems and the functional specification of the signal processing operations involved in such systems.
Project (20) provides the constructional and computing skills required to carry out hardware and software projects, and the application of these skills in a project environment.

Stage 2

Computer systems and microprocessors (20); Electronics II (20); Fields, materials and devices II (20); Signals and communications II (20); Project and professional issues (20).

For Electrical and Electronic Engineering – Dynamic systems and control (10) and Electrical systems and machines (10).

For Electronic Engineering – *Either* Electrical systems and machines (10) *or* Discrete mathematics for computing science (10); and *either* Dynamic systems and control (10) *or* Information theory and coding (10).

Stage 3

MEng Honours
Individual project and dissertation (40); Study project (10); Introduction to business management (10); Optional modules (60) chosen from modules relevant to your chosen specialism.

BEng Honours
Individual project and dissertation (40); Introduction to business management (10); Optional modules (70) chosen from modules relevant to your chosen specialism.

Stage 4

MEng Honours only
Industrial project with report (40); Group design project (30); Extended course work on applications and design (10); Optional modules (40).

Please note: in each Stage you complete modules to a value of 120 credits.
The credit value of each module is given in brackets.



Electronic Communications
MEng Honours (4 years) UCAS code H621
BEng Honours (3 years) UCAS code H640

The development of the Internet, mobile telephones and dedicated high-speed data networks has fuelled a growth in international commerce and home-based shopping, as well as making information and entertainment resources readily available across the globe. We have designed these exciting degree programmes to focus on this growth in electronic communications and the demand for people with appropriate skills to work in the field.

Stage 1 is common with the Electrical and Electronic Engineering, and Electronic Engineering programmes.

In Stage 2 specialist modules in information theory and coding, and discrete mathematics are introduced to begin your specialisation in electronic communications topics. In Stage 3 you undertake a substantial individual project and dissertation on a related topic of your choice, which is complemented by additional modules concentrating on aspects of electronic communications.

The MEng offers increased depth of study through a fourth year, during which you carry out a design study and work as part of a small team on the development of a technical project. In Stage 4 you also undertake an industrial project, which involves working, under guidance, as a junior engineer in a real commercial or research environment. At both Stages 3 and 4 you can choose from a range of further topics, as well as specific communications topics.



MEng and BEng degrees

Stage 1

Circuit theory (20) introduces linear electric circuits and the various tools and techniques employed to analyse more complex circuits in terms of their currents, voltages and power flows.
Electronics I (20) provides an enhanced understanding of basic semiconductor devices, combinational and sequential elements, computer number systems and computer architecture.
Engineering mathematics (20) explores the foundations of basic calculus, differential equations, matrices and vectors in an engineering context.
Fields, materials and devices I (20) examines the basic principles of electromagnetic fields and the application of these fields to electrical machines and semiconductor devices.
Signals and communications I (20) provides an introduction to mobile communication systems and the functional specification of the signal processing operations involved in such systems.
Project (20) provides the constructional and computing skills required to carry out hardware and software projects, and the application of these skills in a project environment.

Stage 2

Computer systems and microprocessors (20); Discrete mathematics (10); Electronics II (20); Fields, materials and devices II (20); Information theory and coding (10); Signals and communications II (20); Project and professional issues (20).

Stage 3

MEng Honours
Individual project and dissertation (40); Digital signal processing (10); Introduction to business management (10); Analogue systems (10); Study project (10); RF engineering (10); Telecommunication networks (10); Optional modules (20).

BEng Honours
Individual project and dissertation (40); Digital signal processing (10); Introduction to business management (10); Analogue systems (10); RF engineering (10); Telecommunication networks (10); Optional modules (30).

Stage 4

MEng Honours only
Mobile and cellular communications (10); Extended course work on applications and design (10); Industrial project (40); Advanced modulation and coding techniques (10); Group design project (30); Optional modules (20).

Please note: in each Stage you complete modules to a value of 120 credits. The credit value of each module is given in brackets.

Electronics and Computer Engineering

MEng Honours (4 years) UCAS code H654
BEng Honours (3 years) UCAS code H652

Tailored to the needs of information engineers, these degrees cover the processing of signals whether they are represented as voltages, currents or numbers inside a computer. The main emphasis is on the design of large computer systems, including software and hardware. Although technically specialised, the approach is not narrowly vocational. From the beginning, the degree programmes concentrate on the computer systems engineering of digital systems, which has evolved from the application of low-cost, complex integrated circuits in information technology. The programmes are run in conjunction with the School of Computing Science.

Stage 1 is broad based, introducing you to the main principles of the subject, while Stage 2 extends your experience so that at the end of it you can confirm whether you wish to specialise or continue with a broad subject choice. In the final year of the BEng degree you undertake an individual project. You also select modules from a wide range of options, which change from year to year to enable you to follow the latest developments in computer systems. The MEng degree allows you to study computer systems in more depth as well as providing greater specialisation in software engineering.



MEng and BEng degrees

Stage 1

Circuit theory (20) introduces linear electric circuits and the various tools and techniques employed to analyse more complex circuits in terms of their currents, voltages and power flows.
Electronics I (20) provides an enhanced understanding of basic semiconductor devices, combinational and sequential elements, computer number systems, and computer architecture.
Engineering mathematics (20) examines the foundations of basic calculus, differential equations, matrices and vectors in an engineering context.

Object-oriented programming (20) provides fundamental data structures and algorithms that can be used as building blocks for more sophisticated programming.
Introduction to problem solving and programming (20) explores the concept of using computer programs to solve problems, and introduces fundamental aspects of programming in the object-oriented imperative programming language, Java.
Signals and communications I (20) introduces mobile communication systems and the functional specification of the signal processing operations involved in such systems.

Stage 2

Advanced programming (20); Computer systems and microprocessors (20); Computer networks and systems programming (20); Discrete mathematics for computing science (10); Electronics II (20); Information theory and coding (10); Project and professional issues (20).

Stage 3

MEng Honours

Signals and communications II (20); Design and test of digital systems (10); *Either* Database technology (20) *or* Modelling and computation (20) *or* Algorithm design and analysis (20); Introduction to business management (10); Project and dissertation (40); Optional modules (20).

BEng Honours

Project and dissertation (40); Introduction to business management (10); *Either* Database technology (20) *or* Modelling and computation (20) *or* Algorithm design and analysis (20); Optional modules (50).

Stage 4

MEng Honours only

Integrated circuit design (10); Industrial project (40); Group project (30); Extended course work on applications and design (10); Optional modules (30).

Please note: in each Stage you complete modules to a value of 120 credits. The credit value of each module is given in brackets.

Foundation Year entry for all programmes

MEng Honours (5 years)
UCAS code H606
BEng Honours (4 years)
UCAS code H604

It is still possible to study electrical and electronic engineering at Newcastle even if you have not taken mathematics and/or science at an appropriate standard for direct entry into Stage 1. The foundation year gives students with proven ability in other subjects the opportunity to become engineers. We run both MEng and BEng Electrical and Electronic Engineering with Foundation Year programmes, which allow you to progress onto any of the electrical, electronic, and computer systems engineering degrees after successful completion of the year. Further information and details of the entrance requirements are available from the *Undergraduate Prospectus* or our website.
www.ncl.ac.uk/undergraduate

Engineering with Foundation Year

If you are not sure which area of engineering you wish to study, we also run more general MEng and BEng Engineering with Foundation Year programmes, which allow you to progress onto any of the engineering degrees available at Newcastle. Please see our website for further information and details of the entrance requirements.
www.ncl.ac.uk/undergraduate

Scholarships and prizes

We offer scholarships to the brightest students, who represent the future of our profession. These scholarships are funded by the School. For Home and EU students we guarantee £1,000 scholarships for every year of study to applicants who meet the conditions of our offer and who put us as their UCAS first choice (ie their FIRM choice). Continuation of the scholarship in subsequent years will be conditional on achieving satisfactory performance, ie not less than a 55 per cent average in the previous year. Foundation year students will be eligible for the scholarship if they progress successfully into Stage 1 of any of the undergraduate programmes in our School.

For international applicants we guarantee a scholarship of £3,000 for students who meet the conditions of our offer for a place on one of the courses in the School and who choose this course as their UCAS first choice. Continuation of the scholarship in subsequent years will be conditional on achieving satisfactory performance, ie not less than a 55 per cent average in the previous year. The international scholarship will be used each year to reduce the University fees which are payable on registration. This scholarship is not available to those applicants applying for the foundation year or who are fully sponsored by a company or government. If a University International Undergraduate Merit Scholarship is also held then the value of the School scholarship will be reduced so as to keep their combined total value in any one year to no more than £3,000.

Prestigious industry scholarships are available at all Stages of our degree programmes and to a substantial number of students on a competitive basis. Newcastle is one of only three UK universities to be a member of the E3 Academy, which offers sponsorship of up to £5,000 per year, including paid vacation placements through UK-based international companies. The E3 Academy is endorsed by the Institution of Engineering and Technology (IET).

Student finance

For general information on tuition fees, bursaries and scholarships please see **www.ncl.ac.uk/undergraduate/finance** or contact Student Services for a copy of our *Guide to Student Finance*.

Entrance requirements

We consider all applicants on an individual basis, taking into account past academic performance, predicted grades, personal qualities and other achievements. If you wish to discuss any aspect of your qualifications or the degree programmes available, we will be happy to advise you. In assessing applicants, we will continue to pay positive regard to participation in activities such as Insight and Headstart courses, ASDAN award, Young Enterprise, Crest Gold awards, and the Engineering Education Scheme. We accept deferred entry, and will usually expect applicants to outline their reasons for taking a gap year and indicate what they will be hoping to do.

Most of our UK students enter Stage 1, but Stage 2 entry is available to well-qualified applicants with higher qualifications, such as the BTEC Higher National Diploma. If you wish to be considered for Stage 2 entry you should state this clearly on your UCAS application. However, please contact us if you wish to discuss your own circumstances. Please note that General Studies and Critical Thinking are not accepted. Entrance requirements can vary from year to year, so you should check our website for up-to-date details. **www.ncl.ac.uk/undergraduate**

Foundation Year entry

A levels

MEng: AAB in any subjects, but excluding General Studies and Critical Thinking. GCSE grade B in Mathematics and Physics (or Dual Award Science) required if not offered at A or AS level.

BEng: ABB in any subjects, but excluding General Studies and Critical Thinking. GCSE grade B in Mathematics and Physics (or Dual Award Science) required if not offered at A or AS level.

Scottish qualifications

MEng: AA/AB in any subject at Advanced Higher. Higher Mathematics and Physics required at grade B if not offered at Advanced Higher. Mathematics and Physics required at grade 2 Standard Grade (or Intermediate 2 equivalent) if not offered at Higher Grade.

BEng: BB in any subject at Advanced Higher. Higher Mathematics and Physics preferred at grade B if not offered at Advanced Higher. Mathematics and Physics required at grade 2 Standard Grade (or Intermediate 2 equivalent) if not offered at Higher Grade.

Stage 1 entry

A levels

MEng: AAB including Mathematics and one other science subject (preferably Physics) but excluding General Studies and Critical Thinking. GCSE Physics or Dual Award Science (minimum grade B) required if not offered at A or AS level.

BEng: ABB including Mathematics and one other science subject (preferably Physics) but excluding General Studies and Critical Thinking. GCSE Physics or Dual Award Science (minimum grade B) required if not offered at A or AS level.

Scottish qualifications

MEng: AA/AB at Advanced Higher including Mathematics and preferably Physics. Higher Physics required at grade B if not offered at Advanced Higher.

BEng: BB at Advanced Higher including Mathematics and preferably Physics. Higher Physics required at grade B if not offered at Advanced Higher.

BTEC National Diploma

Candidates will normally only be considered for entry to BEng.

Access to HE Diplomas

In a relevant area of engineering or physical science. Specific grades and subjects will be required. Please see our website for further details.



Grey's Monument, located in Newcastle's historic Grainger Town.

Newcastle and the region

Newcastle is a vibrant city and the University is at the heart of it, only a few minutes' walk from the main shopping area.

Famous for its nightlife (voted 7th in the world by Trip Advisor 2010), Newcastle offers something to suit all tastes, from cinemas, theatres and live music venues, to a huge variety of bars and restaurants. Newcastle is also becoming a world-class cultural destination. Amongst its many attractions are the Sage Gateshead music centre, which draws musicians from around the globe, and the BALTIC Centre for Contemporary Art, the biggest gallery of its kind in the world.

The ancient castles and countryside of nearby Northumberland and the region's unspoilt beaches are all easily accessible, providing ample opportunities for outdoor enthusiasts, from mountain biking and climbing to surfing. Slightly further afield, but within easy reach, are the Lake District, the Scottish Borders and the Yorkshire Dales.
www.ncl.ac.uk/undergraduate/newcastle



Looking towards Tynemouth Priory from South Shields.

Visiting the University

Don't just take our word for it, come and visit the University to see what we have to offer. If you would like to visit us before you apply, our Visit Days give you the chance to talk to staff and students, explore the campus and accommodation, and attend subject talks in the area you are interested in studying. If we make you an offer, open days for your subject area give you the opportunity to talk to current students and members of staff as well as see the University and its facilities.
www.ncl.ac.uk/undergraduate/visit

International students

Newcastle University is home to a diverse and cosmopolitan community, with over 3,300 international students from more than 110 countries worldwide. With a well-established and dedicated support and advice service, Newcastle has everything you need for a successful and enjoyable student experience. Find out more at **www.ncl.ac.uk/international**

Disabled students

We welcome applications from students with disabilities. Our Student Wellbeing Service is there to provide help and advice whilst you are at the University, and makes every effort to provide a suitable learning environment for you. If you would like to discuss the facilities on campus and any specific requirements you may have, or to request this brochure in an alternative format, please contact our Student Services team (details on the back cover).



NewcastleGateshead Quayside.

Further information

If you have any questions about the degree programmes outlined in this brochure please contact:

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(International) +44 191 222 8180
E-mail: undergrad@eece.ncl.ac.uk
www.ncl.ac.uk/eece

To find out more about the University and its facilities, including accommodation, sports and social activities, or the city and surrounding area, take a look at the University's website or request a copy of the *Undergraduate Prospectus* from **www.ncl.ac.uk/undergraduate**

Student Services
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United Kingdom

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(International) +44 191 208 3333
Enquire online at:
www.ncl.ac.uk/enquiries

THE QUEEN'S ANNIVERSARY PRIZES
FOR HIGHER AND FURTHER EDUCATION
2009

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